Investigation of Juvenile Sea Turtles in the Coastal Waters of Southwest Florida

September 2004

W.N. Witzell, Principal Investigator

Final Report to the Southeast Fisheries Science Center

PRD #07/08-01

1997:

This project will determine the distribution, relative abundance, seasonal occurrence, and size composition of juvenile sea turtles in the 10,000 Islands (Gullivan Bay). Efforts will focus on the Kemp's ridley and green turtles, but it is anticipated that loggerhead turtles will also be encountered during sampling.

In-water sampling will be conducted for one week each month, in which a 200 m run-around strike net will be deployed to captured turtles observed near the vessel. Captured turtles will be measured, weighed, photographed, fitted with two flipper tags and released. In addition, internal PIT tags will be applied to Kemp's ridley turtles captured, and green turtles will have a tissue sample taken for genetic studies conducted by Dr. Brian Bowen of the University of Florida. Environmental data (water temperature, bottom type, depth) will also be collected at the sampling sites.

Supplementary research activities, provided funding can be obtained, may include: radio, sonic, and satellite tracking. We will attempt to put 6 satellite transmitters on Juvenile Kemp's ridleys in 1998 provided funds become available. No other remote sensing is planned in the immediate future.

1998:

Researchers from the National Marine Fisheries Service, Southeast Fisheries Science Center, initiated a preliminary sea turtle survey in June 1997 in Gullivan Bay. We hope to determine the distribution, relative and seasonal abundance, movements, and size composition of turtles in the Bay. The presence of freshwater rivers, mangroves, oyster bars, sea grass flats and an abundance of blue and stone crabs in Gullivan Bay provide a possible developmental habitat for immature endangered sea turtles that has not been explored. The survey was started with the assistance of the Rookery Bay National Estuarine Reserve, who provided initial field and logistical support. Researchers from the Panther Key National Wildlife Refuge, the Nature Conservancy (Naples), and the Collier County Sea Turtle Program have also participated in our preliminary survey.

Initial observations indicate that significant numbers of juvenile ridley and green turtles do, in fact, utilize the Bay. Additionally, some juvenile and adult loggerhead turtles were also observed in the area with some nesting on nearby Cape Romano and various isolated 10,000 Islands beaches.

Sampling areas and methods are currently being explored to optimize our anticipated survey efforts during the 1998 season. The standard method of set netting for turtles in Gullivan Bay is difficult because of the presence of large numbers of marine mammals and recreational boat traffic. Consequently, turtles are being captured by strike net whenever possible and measured, weighed, photographed, flipper and PIT tagged and immediately released. Exploratory netting resulted in the capture of 1 Kemp's ridley (38 cm SCL) and 5 green turtles (Mean = 56 cm SCL).

Other data (water temperature, bottom depth and type) are also collected at each capture site. Tissue samples from green turtles are being collected to determine the genetic composition of the foraging population. Additional studies planned includes radio, sonic, and satellite telemetry to determine movements and foraging behavior and the development of a GIS model for turtle habitat associations.

1999:

Researchers from the National Marine Fisheries Service, Southeast Fisheries

Science Center, initiated a preliminary sea turtle survey in June 1997 in Gullivan Bay. We hope to determine the distribution, relative and seasonal abundance, movements, and size composition of turtles in the Bay. The survey was started with the assistance of the Rookery Bay National Estuarine Reserve, who provided initial field and logistical support. Researchers from the Panther Key National Wildlife Refuge, the Nature Conservancy (Naples), and the Collier County Sea Turtle Program have also participated in our preliminary survey. Initial observations indicate that significant numbers of juvenile ridley and green turtles do, in fact, utilize the Bay as well as numerous manatees and dolphins. Additionally, some juvenile and adult loggerhead turtles were also observed in the area with some nesting on nearby Cape Romano and various isolated 10,000 Islands beaches.

Sampling areas and methods are being explored to optimize our anticipated survey efforts during the 1999 season. The standard method of set netting for turtles in Gullivan Bay is difficult because of the presence of large numbers of marine mammals and recreational boat traffic. Consequently, turtles are being captured by strike net whenever possible and measured, weighed, photographed, flipper and PIT tagged and immediately released. The 1998 netting resulted in the capture of 1 hawksbill turtle 54.2 cm; 1 loggerhead turtle 66.5cm; 2 green turtles 49.3cm/55.8cm; and 7 ridley turtles 35.0cm-52.0cm (X=42.8cm)

Tissue samples were taken from the green and hawksbill turtles for mtDNA analysis by Dr. Brian Bowen and Anna Bass at the University of Florida in Gainesville, FL. The samples are currently stored at the NMFS Miami laboratory until funding is secured for their analysis. Environmental data (water temperature, salinity, depth and bottom type) are also collected at each capture site. Tissue samples from green turtles are being collected to determine the genetic composition of the foraging population.

Additional studies planned includes radio, sonic, and satellite telemetry to determine movements and foraging behavior and the development of a GIS model for turtle habitat associations. The initiation of these projects is dependent upon obtaining adequate supplemental funding. We plan to continue strike-netting juvenile sea turtles in the Gullivan Bay area in 1999, tagging and photographing all captures, and taking tissue samples from green turtles. The estimated duration of this project is 10 years.

2000:

The purpose of this project is to establish relative abundance and habitat requirements of immature sea turtles in the nearshore waters of southwest Florida. Research efforts focus on the highly endangered Kemp's ridley turtle, but other turtle species are opportunistically collected during routine sampling operations.

Mark-recapture techniques are used in Gullivan Bay, Florida, in order to determine distribution, relative abundance, seasonal occurrence, movements, and size composition of marine turtles in southwest Florida. In-water sampling is conducted monthly during which a run-around strike net is deployed to capture turtles. Captured turtles are measured, weighed, fitted with flipper tags, and photographed prior to release. In addition, internal PIT tags are applied to Kemp's ridley and green turtles. Environmental data (water temperature, depth, visibility, bottom type) are also collected at the sampling sites.

During the 2000 calendar year, there were a total of 44 kemp’s ridley, 4 loggerhead, 1 green and 1 hawksbill turtle captures in Gullivan Bay. Blood samples were

collected from all turtles for sex determination and fecal samples were collected from 41 immature Kemp's ridleys. These samples are frozen and are presently located at the Miami Laboratory. It is anticipated that the blood and fecal samples will be analyzed during 2001 Tissue samples were taken from the green, hawksbill, and 4 loggerhead turtles for mtDNA analysis. These samples are currently at the Miami laboratory and will be processed in 2002.

The scope of work will remain the same for 2001 at Gullivan Bay, and the expected completion date of this project is 2008.

Satellite transmitters were placed on 6 large (40+cm) juvenile Kemp's ridley turtles at Cedar Key, Florida (October 2000) using Telonics ST-18 transmitters. These transmitters were mounted using the standard back-pack mount as commonly used by B. Schroeder, A. Bolten, and G. Balazs. All 6 transmitters are presently functioning. This project will be terminated when the transmitters have either fallen off or have ceased transmitting. A final report will be prepared and published on the results.

2001:

Species	Number Captured	Number Recaptures	Total Captures
Kemp's ridley	57	24	81
Loggerhead	3	2	5
Green	3	0	3

This project targets immature turtles only that inhabit coastal waters less than 3 deep. All turtles were captured in a run-around strike net and immediately removed from the water for examination. All turtles were immediately weighed, measured, flipper and PIT tagged, and blood samples collected from the Kemp's ridley and loggerhead turtles for sex determination. These samples have been sent to Dr. Thane Wibbels at the University of Alabama at Birmingham for analysis. Tissue samples were collected from the green and loggerhead turtles for genetic analysis. All these samples are currently archived at the NMFS Miami Laboratory awaiting shipment for analysis at the NMFS La Jolla Laboratory. All turtles were immediately released near the original capture locations. There were no deaths or injuries due to this research.

2002:

Species	Number Captured
Kemp's ridley	21
Loggerhead	1

This project targets immature turtles only that inhabit coastal waters less than 3 deep. All turtles were captured in a run-around strike net and immediately removed from the water for examination. All turtles were immediately weighed, measured, flipper and PIT tagged. All turtles were immediately released near the original capture locations. There were no deaths or injuries due to this research. No turtles were held for fecal examination.

2003:

Two immature turtles were caught on this Permit (1260) in Gullivan Bay, Ten Thousand Islands, southwest Florida: a loggerhead (*Caretta caretta*) and a Kemp's ridley (*Lepidochelys kempii*). Both turtles were captured in a run-around gill net from a leased commercial net vessel. They were measured, tagged with Inconel flipper and Passive Integrated Transponder (PIT) tags and immediately released at the capture site. The entire handling and processing for each of these turtles was less than 45 minutes and both turtles were unharmed during this process.

2004: Visual surveys for sea turtles were conducted by boat from Gullivan Bay to Lostmans River. Surveys were conducted (five consecutive days) monthly, from January 2004 to August 2004. No turtles were captured during this period, and this research project is concluded and publications are being prepared.

Two publications have been produced to date and may be found on the url below:

http://www.sefsc.noaa.gov/seaturtlepeerpublications.jsp

Witzell, W.N. and J.R. Schmid. 2003. Multiple recaptures of a hybrid hawksbill-loggerhead turtle in the Ten Thousand Islands, southwest Florida. Herpetological Review. 34: 323-325.

Witzell, W.N. and J.R. Schmid. 2004. Immature sea turtles in Gullivan Bay, Ten Thousand Islands, southwest Florida. Gulf of Mexico Science. 22: 54-61.

Additional publications will eventually follow:

Schmid, J.R. and W.N. Witzell. In Prep. Seasonal movements of immature Kemp's ridley turtles along the west coast of Florida.

Witzell, W.N., A.A. Geis, J.R. Schmid, and T. Wibbels. In Press. Sex ratio of immature Kemp's ridley turtles (*Lepidochelys kempi*) from Gullivan Bay, Ten Thousand Islands, southwest Florida. Journal of the Marine Biological Association of the United Kingdom. 85.

Witzell, W.N. and J.R. Schmid. In Press. Diet of immature Kemp's ridley turtles (*Lepidochelys kempi)* from Gullivan Bay, Ten Thousand Islands, southwest Florida. Bulletin of Marine Science.

SYNOPSIS OF RESEARCH

OVERVIEW: An in-water survey for immature endangered and threatened sea turtles in the coastal waters of southwest Florida during 1997-2003 yielded 191 Kemp's ridley

(*Lepidochelys kempi*), 15 loggerhead (*Caretta caretta*), 13 green (*Chelonia mydas*), and One hybrid hawksbill (*Eretmochelys imbricata*)-loggerhead turtle. Mean carapace lengths were 40.3 cm minimum straight carapace length (MSCL) for Kemp's ridley, 65.5 cm MSCL for loggerhead, and 51.6 cm MSCL for green turtles. Fibropapilloma tumors were found on seven of the green turtles and one loggerhead turtle. The mean growth rate of recaptured Kemp's ridleys was 6.3 cm/yr. The nearshore waters of Gullivan Bay in the Ten Thousand Islands is an important developmental habitat for the highly endangered Kemp's ridley turtle, and to a lesser degree, immature loggerhead and green turtles.

SEX RATIO: The sex ratio of 100 immature Kemp's ridley turtles (*Lepidochelys kempi*) captured in Gullivan Bay, Ten Thousand Islands, southwest Florida was determined through radioimmunoassay analysis (RIA) of plasma testosterone levels. We determined the sex ratio to be 1.9F: 1M, corroborating the female dominance reported from other studies. The mean sizes of female (N=57) and male turtles (N=30) were 40.9 cm (± 6.9 SD) and 41.9 cm (±6.2 SD), respectively. There were an additional 13 turtles (41.3 cm ±6.5 SD) for which sex could not be determined by this technique. Female-biased sex ratios are not uncommon in reptiles with temperature dependent sex determination. If fecundity is not male-limited, the occurrence of a female-biased sex ratio could enhance the recovery of the endangered Kemp's ridley turtle.

DIET: To examine the diet of immature Kemp's ridley turtles, 66 fecal samples were collected and examined for 64 turtles captured in Gullivan Bay, Ten Thousand Islands, southwest Florida. Prey items were placed into six main categories and the percent frequency of occurrence (FO) and percent dry mass (DM) were calculated: Live Bottom (83.3% FO - 38.6% DM); Crabs (72.7% FO - 34.9% DM); Unidentified (63.6% FO - 24.8% DM); Mollusks (40.9%FO - 1.5% DM); Vegetation (22.7% FO - 0.1% DM); and Fish (1.5% FO - 0.0% DM). The major prey item in the Live Bottom category was a benthic tunicate (*Molgula occidentalis* Traustedt, 1883; 72.7% FO - 30.5% DM), and the two major prey items in the Crabs category were spider crabs (*Libinia* sp.; 42.4% FO - 13.5% DM), and the purse crab (*Persephona mediterranea* Herbst, 1794; 37.9% FO - 8.3% DM). There were small differences in prey consumption between turtles < 40 cm MSCL and those > 40 cm MSCL. The consumption of benthic tunicates by Kemp's ridleys has not been reported in previous dietary studies, suggesting that they are opportunistic feeders taking advantage of an abundant food source. Environmental changes influencing the tunicate population in the Ten Thousand Islands (e.g. South Florida Restoration Project) could impact this unique predator-prey relationship.

SATELLITE TRACKING: Six immature Kemp's ridley turtles were tracked from Cedar Key Florida. The turtles moved south with the onset of the first severe cold front in November when Sea Surface Temperatures (SST) dipped to about 15C. The turtles moved southwards in coastal waters to the Tampa area and two turtles moved further south to the Ft. Meyers area. All turtles went back to the Cedar Key area in the early spring when SST's warmed up to 20C. The annual north/south migration of these turtles indicates that they do not hibernate as the Cedar Key fishermen thought, and it illustrates the importance of west Florida coastal waters to the development of the Kemp's ridley turtle.